

# ADMIN RECORD

Draft

Subsurface Interim Measures/Interim Remedial Action  
Soil Vapor Extraction Pilot Test Plan  
Site No. 2

Enhanced Vapor Extraction of Organic Compounds  
with Electrical Subsurface Heating  
Operable Unit No. 2

East Trenches Area

U.S. Department of Energy

Rock Flats Plant  
Golden, Colorado

Environmental Restoration Management

July 1994

DOCUMENT CLASSIFICATION  
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CLASSIFICATION OFFICE

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## **1 0 Introduction (only a few paragraphs long)**

*what is the problem (background of RF, objectives of demo.)*

*how do we propose to solve it (brief overview of SPSH)*

*how do we know if we've solved it (criteria for success)*

*(what is the problem)*

## **2.0 Objectives**

### **2.1 Purpose of Demonstration**

The purpose of this pilot test is to determine if SPSH is an appropriate technology for removal of VOCs at the Rocky Flats site.

### **2.2 Criteria for success.**

1. Show acceleration of VOC removal over conventional SVE at the Rocky Flats site
2. Show an increase in the extent of removal over conventional SVE of VOCs existing with inhibiting co-contaminants at the Rocky Flats site.
3. Collect sufficient data to project economic feasibility and O&M reliability of additional application of SPSH-SVE at Rocky Flats sites.

## **3.0 Background**

### **3.1 Rocky Flats Site Background**

**3.1.1 Contamination History** (what was the purpose of the Rocky Flats Plant, what waste was dumped in this trench, when was it dumped)

#### **3.1.2 IHSS 110 Trench and Operable Unit 2**

**3.1.3 Geological Characterization** (general discussion about the site geology, soil stratigraphy - very little specific data unless it helps the reader understand the site)

**3.1.4 Contamination Characterization** (soil gas surveys, soil contamination samples, extraction well concentrations, etc )

### **3.2 Remediation of VOC contaminated soil**

**3.2.1 SVE** (brief description of SVE, in what situations is it effective)

**3.2.2 Thermally Enhanced SVE** (why does thermal enhancement work, what are the traditional methods and their drawbacks, brief mention of SPSH)

**3.3 SVE, Pilot Test No. 1 results** (what data was collected during this test, how it will be used to compare against pilot test no. 2)

(how we propose to solve the problem )

#### **4 0 Approach (SPSH Description and Equipment)**

**4.1 SPSH Technology Profile** (geometry, physics, how it works)

**4.2 Process Description** - what we expect to happen in the soil during SPSH (describe the heating patterns, how permeabilities will change, additional driving force for flow with steam generation, changes in equilibrium of contaminants between liquid and gas phases, etc )

**4.3 Power System/Electrodes**

**4.4 Venting** (there is a need for improved venting due to low permeability soil)

**4.4.1 Vertical/Horizontal Vents** (both positive and negative pressure, some general discussion about screening depth)

**4.4.2 Surface Plenum** (most contamination near surface, to capture this and increase flowrate, a surface vent is important)

**4.4.3 Expected Flowrates** (brief description of expected flowrates and the models used to get them.)

**4.5 Heating** (what SPSH heating pattern looks like and how it is accomplished)

**4.5.1 Water addition** (why we need water addition, how - generally- we plan to do it)

**4.5.2 Energy Control** (what mode of operation -constant power or voltage- are we planning to use and why).

(how we know if we solved the problem)

#### **5.0 Technical Data Collection Strategy**

##### **5.1 overview**

###### **5.1.1 Baseline test**

a. **Purpose** (test of SVE for comparison to SPSH)

b. **Duration** (as long as it takes to determine SVE performance, use model to predict this duration)

###### **5.1.2 Heating test to compare.**

a. **Expected differences** (how SPSH will be different from SVE)

b. **Duration** (when do we quit?)

**5.1.3 Modeling** (overview of TOUGH2 model, what it can accurately model, what it can't, what are it's results)

##### **5.2 Characterization**

**5.2.1 Data for Modeling** (data needed for modeling: absolute and relative permeabilities, capillary pressure vs. water content, thermal conductivities, heat capacities, etc)

**5.2.2 Pre-Test Data for Demonstration Performance Evaluation** (data needed to evaluate SPSH performance, core samples before the test, etc.)

**5.2.3 On-Line Sampling and Test Monitoring** (off gas concentrations, power related data, temperatures, pressures, etc)

**5.2.4 Post-Test Characterization** (data needed to compare to pre-test data for SPSH performance evaluation, core samples after the test, etc )

## **6.0 Technical Data Analysis and Interpretation**

**6.1 Presentation of Data** (plots of pertinent data temperature, power, and off gas concentration with time, etc )

**6.2 Effects of Temperature** (changes of off gas concentration over traditional SVE conc due to increased vapor pressure, decreases in electrical resistivity)

**6.3 Effect of soil drying** (increases in permeability and electrical resistivity)

**6.4 Modeling** (modeled predictions of all of the above)

## **7.0 Cost Data**

**7.1 Operational** (What operating costs will be collected during this test; power, operator time, maintenance, etc)

**7.2 Capital** (What capital costs are involved with putting together a SPSH treatment system; including power supply and transformers, electrode installation, drip installation, offgas treatment system, monitoring equipment, etc)

**7.3 Alternative remediation methods** (Typical costs of other remediation technologies when applied to similar situations)

(details, can be in any order)

## **8.0 Demonstration Equipment**

**8.1 Power Source**

**8.2 SPSH Power Supply**

**8.3 SPSH Electrodes and Electrode Wetting System**

**8.4 Soil Vacuum Vent and Condensate Management System**

**8.5 Controls, Monitoring, and Instrumentation**

**8.6 Offgas Treatment System**

**8.7 Laboratory and Support Facilities**

## **9.0 Test Operation and Waste Management**

**9.1 Baseline Soil Vapor Extraction Test**

**9.1.1 Test Design**

**9.1.2 Test Operation and Monitoring**

**9.2 Six Phase Soil Heating Test**

**9.2.1 System Start-Up**

**9.2.2 Operation During Demonstration**

**9.2.2.1 Electrical System**

**9.2.2.2 Gas Sampling and Equipment Monitoring**

**9.2.2.3 Condensate Management**

**9.2.3 Shut Down Operations**

**9.2.3.1 Normal Shut-Down Procedures**

**9.2.3.2 Emergency Shut-Down Procedures**

**9.2.4 Response to System Anomalies**

**9.2.4.1 Loss of SPSH Power Control**

**9.2.4.2 Offgas Treatment System Failure**

**9.2.4.3 Monitoring Failure**

**9.2.4.4 Loss of Power**

- 10 0    Schedule of Events and Deliverables
  - 10 1    Test Plan Development
  - 10.2    Field Mobilization
  - 10.3    Operations Schedule
  - 10.4    Final Report
  - 10.5    Records Turnover
- 11.0    Health & Safety Planning
  - 11.1    Demonstration Safety Plan
  - 11.2    Notification and Emergency Procedures
- 12.0    Permits
  - 12.1    Operational Permits
  - 12.2    Patents
- 13.0    Sampling Plan/Data Management/DQO's
- 14.0    References

#### Appendix

- 1.    Division of Responsibilities (PNL, EG&G, WC)
- 2.    Detailed Designs